DATA TECH
A PENRIL COMPANY

MODEL 4412

20,000 count line powered DPM with gas discharge display

GENERAL DESCRIPTION

The DATA TECH Model 4412 is a 20,000 count digital panel meter designed for applications which require .01% error and .005% resolution. This model features synchronous dual slope analog to digital conversion and comes standard with unbuffered BCD outputs and planar seven-segment gas discharge display. Units are shipped from the factory with the read-rate set for 5 readings per second, however, rates from 0.1 to 15 per second may be specified. The Model 4412 may be ordered to operate from 100, 115 and 230 Vac. Available full scale ranges include voltages from 200mV to 1000Vdc and currents from 2μA (100pA resolution) to 200mA.

OUTSTANDING FEATURES

- Gas Discharge Display
- NEMA Standard Case
- Up to 15 Readings/Second
- Unbuffered BCD Output Standard
- 1000V Range Available
- 2μA Current Range Resolves 100pA

MP MASTER
MA25740

SPECIFICATIONS

All performance specifications apply at 23°C ±1°C after 30 minutes warm-up unless otherwise specified.

INPUT

Configuration: Single-ended. Bipolar

Voltage Range:	200mV	2V	20V	200V	1000V
Input Z:	1000MΩ	1000MΩ	——10MΩ——		
Bias Current:	100pA	100pA	10pA	0	0
Input Protection:	250Vpk	250Vpk	——1000Vpk——		
Resolution:	10μV	100μV	1mV	10mV	100mV

Current Range:	2μA	20μA	200μA	2mA	20mA	200mA
Input R:	100KΩ	10KΩ	1KΩ	100Ω	10Ω	1Ω
Voltage Burden:	——— 200mV ———					
Resolution:	100pA	1nA	10nA	100nA	1μA	10μA

Normal Mode Rejection: 31dB @ 50Hz, 34db @ 60Hz

Common Mode Rejection Ratio: 100dB with 1kΩ unbalance dc to 100kHz

Common Mode Voltage: 500Vpk signal leads to ac power common, 0V signal leads to BCD output common

Step Response: 670 milliseconds to within 0.01% of final value

PERFORMANCE

Error: 24 hours @ 23°C: ± (0.01% of reading + 2 counts)
90 days @ 23°C ± 10°C:
200mV & 2V models ± (0.01% of reading + 2 counts)
20V, 200V & 1kV models ± (0.02% of reading + 2 counts)
Current Models ± (0.03% of reading + 2 counts)

Reading Tempco:

200mV & 2V models	0.005% reading/°C
20V, 200V & 1kV models	0.008% reading/°C
Current models	0.01% reading/°C

Zero Stability: 0.1 count/°C

Warm Up Time To Rated Accuracy: 30 minutes

CONVERSION

Technique: Synchronous dual slope

Signal Integrate Time: 3.33 milliseconds

Read Rate: 5/second standard. From 0.1 to 15/second optional

Adjustments: + Full Scale, - Full Scale, Amp. Zero, Unit Zero

DISPLAY

Type: Beckman planar seven segment gas discharge

Size: 1.1cm (0.43") high

Maximum Display: ± 1.9.9.9.9

Polarity Indication: Both plus and minus sign are displayed

Overdrive Indication: Most significant digit flashes

Decimal Points: Four decimal points may be remotely programmed at the card edge connector

DIGITAL INTERFACE

Levels:

- **Logical "0":** 0 to 0.6V
- **Logical "1":** 2.4 to 5.5V

Unit Load:

- **Logical "0":** 1.6mA
- **Logical "1":** 0.04mA

BCD OUTPUT

17 positive true lines capable of driving 8 TTL loads. Unbuffered

CONTROL LINES

Overrange: "1" indicates a reading greater than ±19999 counts. Output drive = 8 unit loads

Polarity (+): "1" indicates positive polarity. Output drive = 8 unit loads

Print: "0" indicates that data on the BCD output lines is valid. Output drive = 7 unit loads

Hold: "0" inhibits conversions. Conversion in process when line is taken low is completed and data is held valid. Next conversion starts 200 milliseconds after hold is taken high. Input load = 1 unit load

Decimal Points: 1.XXXX, 1X.XXX, 1XX.XX and 1XXX.X may be programmed at the card edge connector by connecting the appropriate pin to digital ground. 0V @ - 800μA lights the selected decimal point. If active components are used to switch decimal points, they must be capable of withstanding 90 volts breakdown

POWER

Power Input: Unit purchased to operate from one of the three following inputs:

105-125V	50/60Hz	8 Watts
207-253V	50/60Hz	8 Watts
90-110V	50/60 Hz	8 Watts

MECHANICAL

Case Type: NEMA. Front mounting, cam retained

Case Construction: Styrene acrylic butadyne. 20% glass filled

Case Dimensions: 45.7mm H x 102.9mm W x 121.6mm D (1.8" H x 4.05" W x 4.787" D)

Weight: 540 grams (19 oz.)

Connection:

- **Analog:** 30 pin card edge. 3.96mm (0.156") spacing
- **Digital:** 20 pin card edge. 3.96mm (0.156") spacing

Data Tech
Operating & Installation Instructions for Models 4312 and 4412

MODEL 4412

The accuracy of the meter should be established at 90 day intervals. Accuracy is confirmed when known inputs yield corresponding displays, within specified accuracy.

CALIBRATION (Figure 4-1)

1. Remove the snap-on bezel.
2. Using the voltage standard for voltmeters and the current standard for ammeters, provide a zero level ANALOG INPUT.
3. Initiate 115 volts ac power ON and allow 20 minutes warm-up.
4. Adjust R9 until the polarity display toggles between "+" and "−". Turn R9 slightly clockwise until the "+" remains ON.
5. Set the standard to the level which should yield a 0010 display. Adjust R30 for this display.
6. Return the standard to a zero level. Verify a display of 0000; if not, repeat steps 4 and 5.
7. Set the standard to a level which should yield a display midway between +19997 and +19998, and adjust R50 for a display that toggles between +19997 and +19998.

GENERAL

8. Set the standard to a level which should yield a display midway between -19997 and -19998, and adjust R26 for a display that toggles between -19997 and -19998.
9. Repeat steps four through nine if necessary, nullifying any interaction of the adjustments.

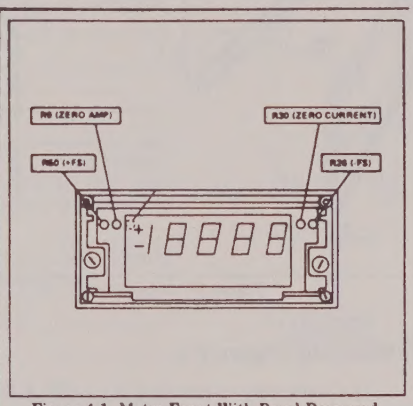


Figure 4-1. Meter Front With Bezel Removed Showing Calibration Potentiometers

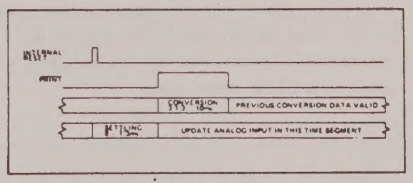


Figure 2-4. $\overline{\text{PRINT}}$ Output Timing

MODEL 4312

4-5 CALIBRATION (Figure 4-1)

1. Remove the snap-on bezel.
2. Connect the ANALOG INPUT to the GROUND terminal.
3. Initiate 115 volt ac power ON.
4. Adjust R10 for a display of 000 with the "+" and "−" display toggling.
5. Remove the connections to the ANALOG INPUT.

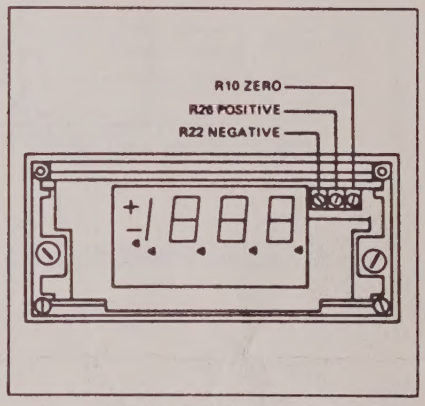


Figure 4-1. Meter Front With Bezel Removed Showing Calibration Potentiometers

6. Using the voltage standard for voltmeters or the current standard for ammeters, provide the ANALOG INPUT necessary for a +1900 display.
7. Adjust R26 for a +1900 display.
8. If the meter is bipolar, repeat step 6, providing a −1900 input. Adjust R22 for a −1900 display.

2-13. DIGITAL INPUT-OUTPUT Lines

2-14. The DIGITAL OUTPUT lines are DTL and TTL compatable, with positive true positive logic levels as follows:

"1" = +2.4 to +5.5 volts
"0" = 0 to +0.4 volts

2-15 BCD OUTPUT LINES (17) 4412

2-16 The 17 lines labeled BCD DIGIT provide binary coded decimal logic levels representative of the ANALOG INPUT.

2-17 OVERRANGE OUTPUT LINE

2-18 The OVERRANGE line is a "1" for "off scale" readings (greater than 19999 decimally) and a "0" for "in scale" readings.

2-19 POLARITY (+) OUTPUT LINE

2-20 The POLARITY (+) line is a "1" for positive input levels and a "0" for negative levels.

2-21. $\overline{\text{PRINT}}$ OUTPUT LINE

2-22 The $\overline{\text{PRINT}}$ line is a "0" during the times the other output lines carry valid data and a "1" during times the output lines are changing due to the conversion process (See Figure 2-4).

2-23. $\overline{\text{HOLD}}$ INPUT LINE

2-24. A "0" at the $\overline{\text{HOLD}}$ input inhibits conversions. Previous conversion data remains stored and available at the BCD output lines and display when $\overline{\text{HOLD}}$ is made a "0". The next conversion is started about 200 milliseconds after $\overline{\text{HOLD}}$ is returned to a "1".

2-25. For single conversion operation, allow the $\overline{\text{HOLD}}$ line to remain a "1" until the PRINT line goes to a "1". Return the $\overline{\text{HOLD}}$ to a "0" within the following 250 milliseconds to prevent additional conversions. For faster rates, consult Data Tech regarding special modifications.

2-26. The $\overline{\text{HOLD}}$ driving circuitry must be open collector or equivalent. Figure 2-5 shows a $\overline{\text{HOLD}}$ drive circuit which is compatible with DTL and TTL logic levels. Note the inversion.

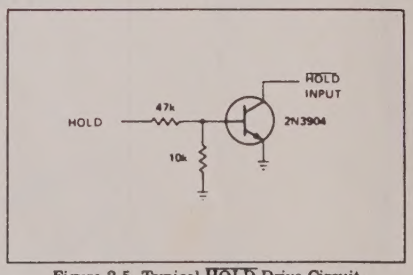


Figure 2-5. Typical $\overline{\text{HOLD}}$ Drive Circuit

2-27. DECIMAL POINT INPUTS

2-28. The drive circuitry to the DECIMAL POINT inputs, if used, must be capable of withstanding 80 volts when OFF.

CAUTION

If the most significant digit lamp flashes, an overrange condition exists. Excessive overrange levels may cause damage to the meter. Remove the ANALOG INPUT and determine that any overrange level is within specified limits.

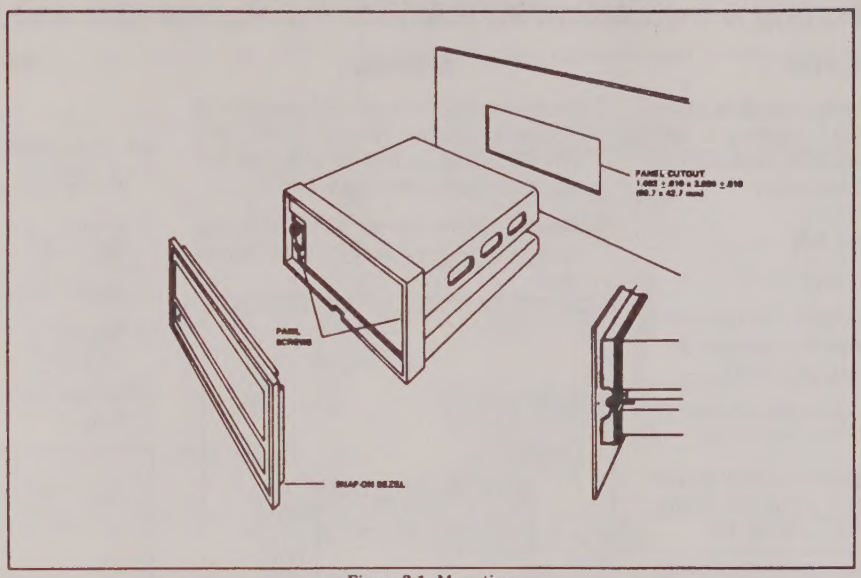


Figure 2-1. Mounting

Mounting (Figure 2-1)

The meter may be mounted in a 1.682 ±.010 by 3.924 ±.010 inch panel cutout. To mount, remove the snap-on meter bezel; rotate the pawl screws several turns counter clockwise to retract pawls; insert meter in panel; tighten pawl screws, and replace bezel. See Figure 2-2 for dimensions. Do not obstruct the vent holes on either side of the meter case.

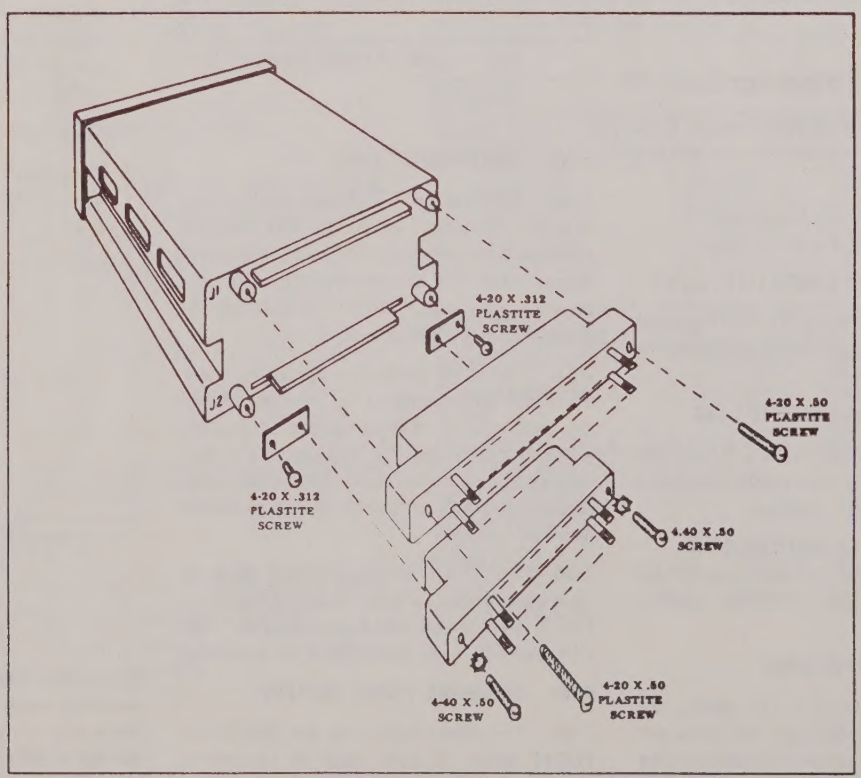


Figure 2-3. Connector Mounting

MATING CONNECTORS

J1 Analog: Elco 00-6007-030-980-002
Viking 2VK15D2/1-2
SAE SAC 15D/1-2

J2 Digital: Elco 00-6007-020-980-002
Viking 2VK10D2/1-2
SAE SAC 10D/1-2

ENVIRONMENTAL

Storage Temperature Range: -10°C to +85°C

Operating Temperature Range: 0°C to +55°C

Humidity: 85% non-condensing

RELIABILITY

Burn-In: Units burned in for a minimum of 120 hours. Temperature is cycled between 25°C & 55°C and line voltage is cycled on and off in order to identify defective components

Traceability: Standards used in calibrating the instruments are traceable to the National Bureau of Standards.

Recommended Calibration Interval: 90 days

Warranty Period: One year

PIN ASSIGNMENT LIST

J1 (Upper Connector)

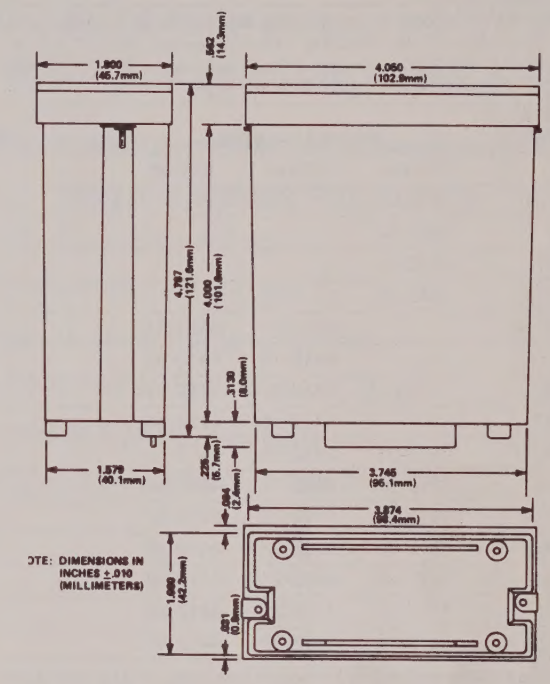
A	Analog in 20V, 200V & 1kV	1	* -15Vdc
B		2	Analog in 200mV, 2V & all ammeters
C		3	
D		4	
E	* +28Vdc	5	
F	* +200V peak	6	
H	Display Decimal Point	7	
J	Display Keep-Alive	8	
K	$\overline{\text{Hold}}$	9	
L	Overrange	10	Analog Gnd
M	* +5Vdc	11	1.XXXX Decimal Point
N	Digital Gnd.	12	1X.XXX Decimal Point
P	* +15Vdc	13	1XX.XX Decimal Point
R	Shield	14	1XXX.X Decimal Point
S	115 Vac LO	15	115 Vac HI

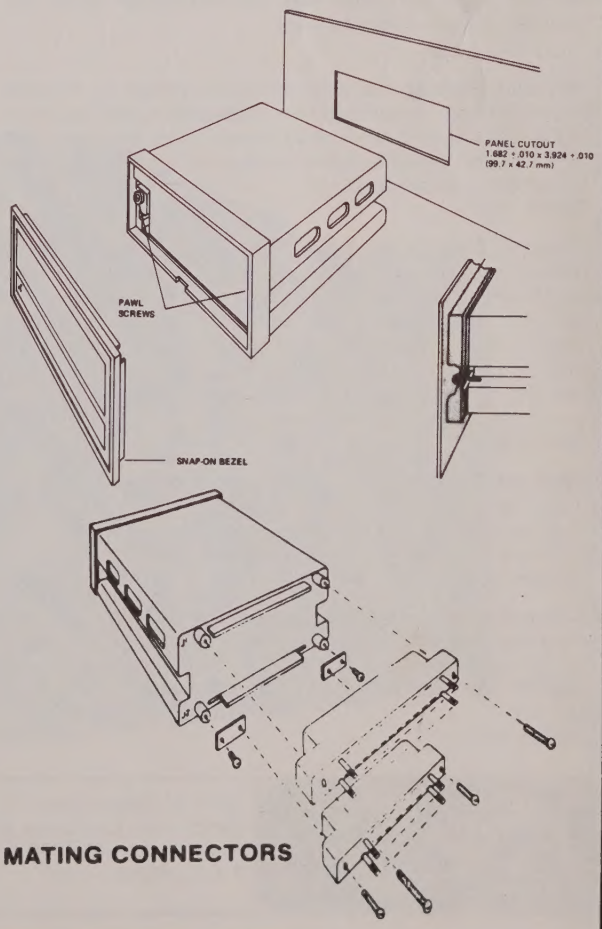
* Test points — not for external loads

J2 (Lower Connector)

A	BCD 1 Bit	1	BCD 4 Bit
B	BCD 2 Bit	2	Digital Gnd.
C	BCD 10 Bit	3	BCD 8 Bit
D	BCD 20 Bit	4	BCD 40 Bit
E	BCD 100 Bit	5	BCD 80 Bit
F	$\overline{\text{Print}}$	6	BCD 400 Bit
H	BCD 200 Bit	7	BCD 800 Bit
J	BCD 1000 Bit	8	BCD 4000 Bit
K	BCD 2000 Bit	9	BCD 8000 Bit
L	BCD 10K Bit	10	+ Polarity

CASE OUTLINE





MATING CONNECTORS

ORDERING INFORMATION

MODEL 4412

Model 4412 20,000 count Digital Voltmeter in NEMA case: For operation from 50/60Hz line frequency. Select model number from chart below based on required full scale range and available power line voltage:

Full Scale Range	Power Line Volts		
	115Vac	230Vac	100Vac
±200mV	4412-01		
±2V	4412-02		
±20V	4412-03		
±200V	4412-04		
±200mV		4412-12	4412-31
±2V		4412-13	4412-32
±20V		4412-14	4412-33
±200V		4412-15	4412-34
±1000V	4412-05	4412-16	4412-35
±2μA	4412-06	4412-17	4412-36
±20μA	4412-07	4412-18	4412-37
±200μA	4412-08	4412-19	4412-38
±2mA	4412-09	4412-20	4412-39
±20mA	4412-10	4412-21	4412-40
±200mA	4412-11	4412-22	4412-41

Optional Connector Kit: Provides one dual 15 and one dual 10 card edge connector with pierced solder terminals. Includes mounting hardware
P/N 548403-100

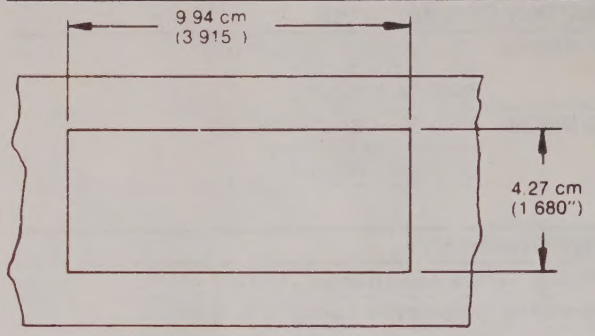
Optional Scaling: Factory will scale meter to provide desired range of readings from customer specified input signal. Signal to display relationship must be linear and pass through zero. Customer must specify maximum input signal and desired reading
Option AS-1

Optional Zero Offset & Scaling: Factory will scale and offset meter to provide desired range of readings from customer specified input signal. Typical uses would be with 4 - 20mA and 10 - 50mA current loops. Signal to display relationship must be linear and all displayed numbers must be of the same polarity. Customer must specify minimum and maximum input signal levels and minimum and maximum display
Option SZ-1

Optional Customized Lens: Factory screens artwork on meter lens per customer specification. Price involves non-recurring engineering charge for generation of screen plus unit price adder for lens production
Option CL-1

Optional Non-Standard Read Rate: Factory will internally set meter read-rate to any value from 0.1 readings/second to 15 readings/second. Units without this option are shipped from the factory with a read rate of 5 readings/second.
Option RR-1

PANEL CUT-OUT



OTHER PRODUCTS

DATA TECH manufactures these other fine products. Ask your sales representative for detailed data sheets.

DIGITAL MULTIMETERS

- 2,000, 5,000, 12,000 & 20,000 counts full scale
- LED, LCD & gas discharge displays
- Line and battery powered
- Standard and ruggedized models
- Auto zero and auto polarity
- Enclosed rotary selector switch wafers for high reliability
- Durably packaged for benchtop or portable use
- Competitively priced

DATA ACQUISITION SYSTEMS

- Up to 1024 channels input
- 15 bit resolution
- 40kHz throughput
- Universal computer & bus interfacing
- Low-level cards provide 5mV full scale capability
- Low-level & high-level channels may be intermixed
- Plug-in cards allow system flexibility

LOGIC CARDS

- 4½" x 2⅛" format
- Several logic families available
- Hundreds of circuit configurations
- Full line of housings
- Ideal for custom control circuits and system breadboarding

DATA TECH
A PENRIL COMPANY

3110 W. Segerstrom - P.O. Box 5130
Santa Ana, California 92704-0130
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TWX: 910/595-1570

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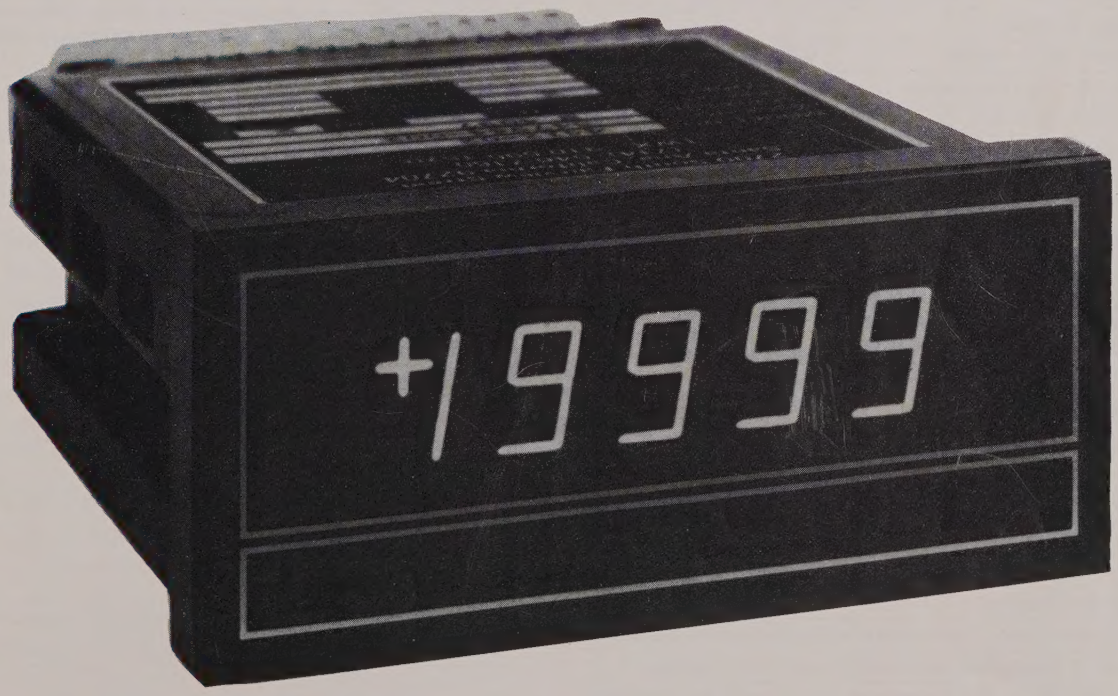
OUTSTANDING FEATURES

- Gas Discharge Display
- NEMA Standard Case
- Up to 15 Readings/Second
- Unbuffered BCD Output Standard
- 1000V Range Available
- 2μA Current Range Resolves 100pA



SPECIFICATIONS

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INPUT

Configuration: Single-ended. Bipolar					
Voltage Range:	200mV	2V	20V	200V	1000V
Input Z:	1000MΩ	1000MΩ	——10MΩ——		
Bias Current:	100pA	100pA	10pA	0	0
Input Protection:	250Vpk	250Vpk	——1000Vpk——		
Resolution:	10μV	100μV	1mV	10mV	100mV
Current Range:	2μA	20μA	200μA	2mA	20mA	200mA
Input R:	100KΩ	10KΩ	1KΩ	100Ω	10Ω	1Ω
Voltage Burden:	——— 200mV ———					
Resolution:	100pA	1nA	10nA	100nA	1μA	10μA

Normal Mode Rejection: 31dB @ 50Hz, 34db @ 60Hz

Common Mode Rejection Ratio: 100dB with 1kΩ unbalance dc to 100kHz

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Warm Up Time To Rated Accuracy: 30 minutes

CONVERSION

Technique: Synchronous dual slope

Signal Integrate Time: 3.33 milliseconds

Read Rate: 5/second standard. From 0.1 to 15/second optional

Adjustments: + Full Scale, - Full Scale, Amp. Zero, Unit Zero

DISPLAY

Type: Beckman planar seven segment gas discharge

Size: 1.1cm (0.43") high

Maximum Display: ± 1.9.9.9.9

Polarity Indication: Both plus and minus sign are displayed

Overdrive Indication: Most significant digit flashes

Decimal Points: Four decimal points may be remotely programmed at the card edge connector

DIGITAL INTERFACE

Levels:

- **Logical "0":** 0 to 0.6V
- **Logical "1":** 2.4 to 5.5V

Unit Load:

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Case Dimensions: 45.7mm H x 102.9mm W x 121.6mm D (1.8" H x 4.05" W x 4.787" D)

Weight: 540 grams (19 oz.)

Connection:

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MATING CONNECTORS

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SAE SAC 15D/1-2

J2 Digital: Elco 00-6007-020-980-002
Viking 2VK10D2/1-2
SAE SAC 10D/1-2

ENVIRONMENTAL

Storage Temperature Range: -10°C to +85°C

Operating Temperature Range: 0°C to +55°C

Humidity: 85% non-condensing

RELIABILITY

Burn-In: Units burned in for a minimum of 120 hours. Temperature is cycled between 25°C & 55°C and line voltage is cycled on and off in order to identify defective components

Traceability: Standards used in calibrating the instruments are traceable to the National Bureau of Standards.

Recommended Calibration Interval: 90 days

Warranty Period: One year

PIN ASSIGNMENT LIST

J1 (Upper Connector)

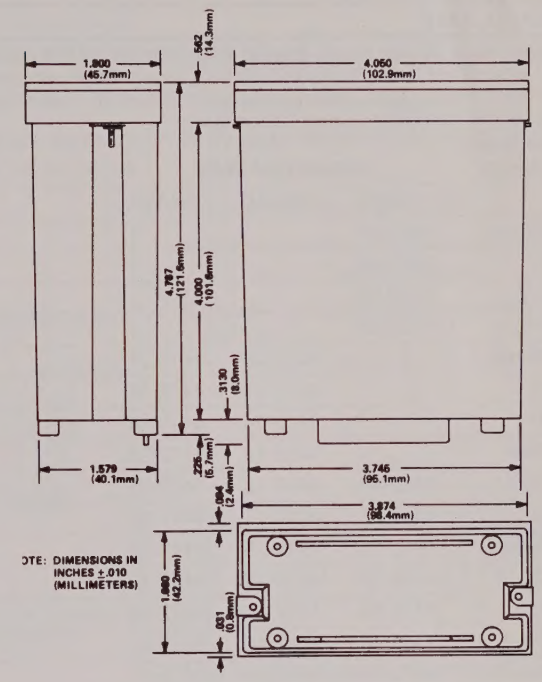
A	Analog in 20V, 200V & 1kV	**1**	* -15Vdc
B		**2**	Analog in 200mV, 2V & all ammeters
C		**3**	
D		**4**	
E	* +28Vdc	**5**	
F	* +200V peak	**6**	
H	Display Decimal Point	**7**	
J	Display Keep-Alive	**8**	
K	$\overline{\text{Hold}}$	**9**	
L	Overrange	**10**	Analog Gnd
M	* +5Vdc	**11**	1.XXXX Decimal Point
N	Digital Gnd.	**12**	1X.XXX Decimal Point
P	* +15Vdc	**13**	1XX.XX Decimal Point
R	Shield	**14**	1XXX.X Decimal Point
S	115 Vac LO	**15**	115 Vac HI

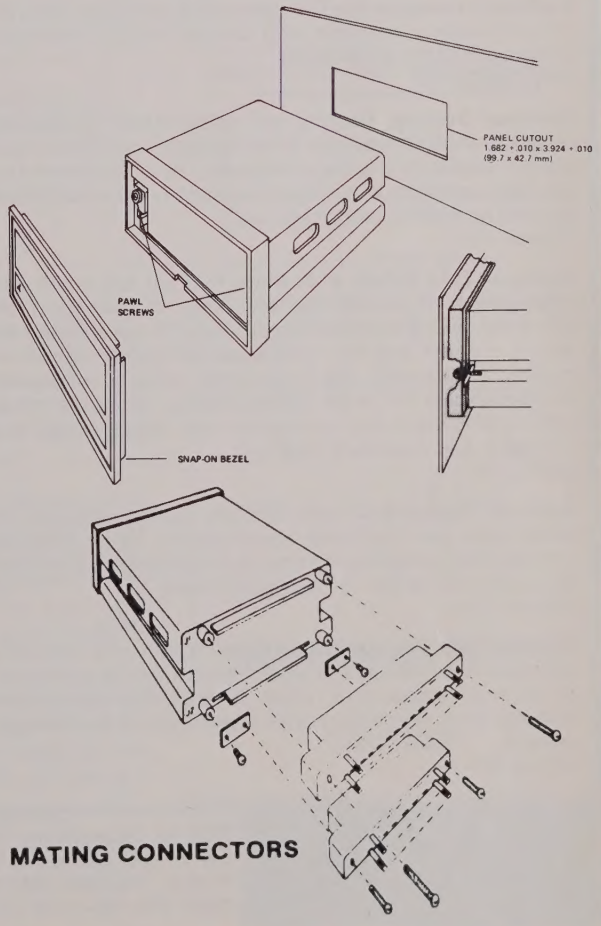
* Test points — not for external loads

J2 (Lower Connector)

A	BCD 1 Bit	**1**	BCD 4 Bit
B	BCD 2 Bit	**2**	Digital Gnd.
C	BCD 10 Bit	**3**	BCD 8 Bit
D	BCD 20 Bit	**4**	BCD 40 Bit
E	BCD 100 Bit	**5**	BCD 80 Bit
F	$\overline{\text{Print}}$	**6**	BCD 400 Bit
H	BCD 200 Bit	**7**	BCD 800 Bit
J	BCD 1000 Bit	**8**	BCD 4000 Bit
K	BCD 2000 Bit	**9**	BCD 8000 Bit
L	BCD 10K Bit	**10**	+ Polarity

CASE OUTLINE





MATING CONNECTORS

ORDERING INFORMATION

MODEL 4412

Model 4412 20,000 count Digital Voltmeter in NEMA case: For operation from 50/60Hz line frequency. Select model number from chart below based on required full scale range and available power line voltage:

Full Scale Range	Power Line Volts		
	115Vac	230Vac	100Vac
±200mV	4412-01		
±2V	4412-02		
±20V	4412-03		
±200V	4412-04		
±200mV		4412-12	4412-31
±2V		4412-13	4412-32
±20V		4412-14	4412-33
±200V		4412-15	4412-34
±1000V	4412-05	4412-16	4412-35
±2μA	4412-06	4412-17	4412-36
±20μA	4412-07	4412-18	4412-37
±200μA	4412-08	4412-19	4412-38
±2mA	4412-09	4412-20	4412-39
±20mA	4412-10	4412-21	4412-40
±200mA	4412-11	4412-22	4412-41

Optional Connector Kit: Provides one dual 15 and one dual 10 card edge connector with pierced solder terminals. Includes mounting hardware
P/N 548403-100

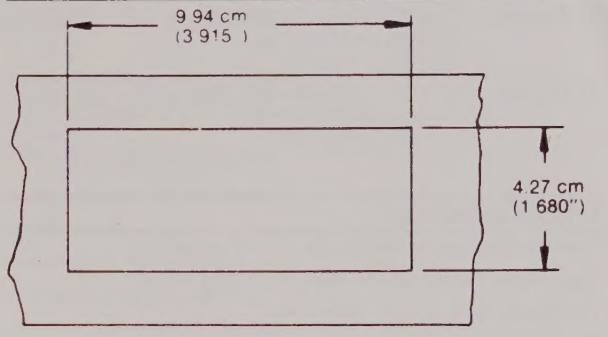
Optional Scaling: Factory will scale meter to provide desired range of readings from customer specified input signal. Signal to display relationship must be linear and pass through zero. Customer must specify maximum input signal and desired reading
Option AS-1

Optional Zero Offset & Scaling: Factory will scale and offset meter to provide desired range of readings from customer specified input signal. Typical uses would be with 4 - 20mA and 10 - 50mA current loops. Signal to display relationship must be linear and all displayed numbers must be of the same polarity. Customer must specify minimum and maximum input signal levels and minimum and maximum display
Option SZ-1

Optional Customized Lens: Factory screens artwork on meter lens per customer specification. Price involves non-recurring engineering charge for generation of screen plus unit price adder for lens production
Option CL-1

Optional Non-Standard Read Rate: Factory will internally set meter read-rate to any value from 0.1 readings/second to 15 readings/second. Units without this option are shipped from the factory with a read rate of 5 readings/second.
Option RR-1

PANEL CUT-OUT



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DATA TECH manufactures these other fine products. Ask your sales representative for detailed data sheets.

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- Enclosed rotary selector switch wafers for high reliability
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- Universal computer & bus interfacing
- Low-level cards provide 5mV full scale capability
- Low-level & high-level channels may be intermixed
- Plug-in cards allow system flexibility

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Data Tech
Operating & Installation Instructions for Models 4312 and 4412

MODEL 4412

The accuracy of the meter should be established at 90 day intervals. Accuracy is confirmed when known inputs yield corresponding displays, within specified accuracy.

CALIBRATION (Figure 4-1)

1. Remove the snap-on bezel.
2. Using the voltage standard for voltmeters and the current standard for ammeters, provide a zero level ANALOG INPUT.
3. Initiate 115 volts ac power ON and allow 20 minutes warm-up.
4. Adjust R9 until the polarity display toggles between "+" and "−". Turn R9 slightly clockwise until the "+" remains ON.
5. Set the standard to the level which should yield a 0010 display. Adjust R30 for this display.
6. Return the standard to a zero level. Verify a display of 0000; if not, repeat steps 4 and 5.
7. Set the standard to a level which should yield a display midway between +19997 and +19998, and adjust R50 for a display that toggles between +19997 and +19998.

Note

If the display specified in step seven can not be attained, remove the meter from the case, and adjust R48 (+FS coarse). R48 is located directly to the right of R50 and R9.

2-13. DIGITAL INPUT-OUTPUT Lines

2-14. The DIGITAL OUTPUT lines are DTL and TTL compatable, with positive true positive logic levels as follows:

"1" = +2.4 to +5.5 volts
"0" = 0 to +0.4 volts

2-15 BCD OUTPUT LINES (17)

2-16 The 17 lines labeled BCD DIGIT provide binary coded decimal logic levels representative of the ANALOG INPUT.

2-17 OVERRANGE OUTPUT LINE

2-18 The OVERRANGE line is a "1" for "off scale" readings (greater than 19999 decimally) and a "0" for "in scale" readings.

2-19 POLARITY (+) OUTPUT LINE

2-20 The POLARITY (+) line is a "1" for positive input levels and a "0" for negative levels.

2-21. $\overline{\text{PRINT}}$ OUTPUT LINE

2-22 The $\overline{\text{PRINT}}$ line is a "0" during the times the other output lines carry valid data and a "1" during times the output lines are changing due to the conversion process (See Figure 2-4).

GENERAL

8. Set the standard to a level which should yield a display midway between -19997 and -19998, and adjust R26 for a display that toggles between -19997 and -19998.
9. Repeat steps four through nine if necessary, nullifying any interaction of the adjustments.

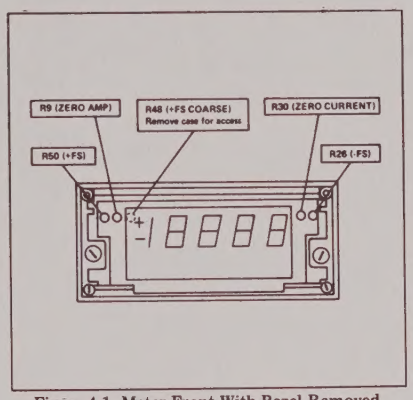

Figure 4-1. Meter Front With Bezel Removed Showing Calibration Potentiometers

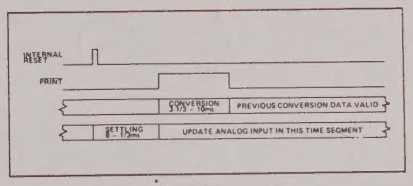

Figure 2-4. $\overline{\text{PRINT}}$ Output Timing

2-23. $\overline{\text{HOLD}}$ INPUT LINE

2-24. A "0" at the $\overline{\text{HOLD}}$ input inhibits conversions. Previous conversion data remains stored and available at the BCD output lines and display when $\overline{\text{HOLD}}$ is made a "0". The next conversion is started about 200 milliseconds after $\overline{\text{HOLD}}$ is returned to a "1".

2-25. For single conversion operation, allow the $\overline{\text{HOLD}}$ line to remain a "1" until the PRINT line goes to a "1". Return the $\overline{\text{HOLD}}$ to a "0" within the following 250 milliseconds to prevent additional conversions. For faster rates, consult Data Tech regarding special modifications.

2-26. The $\overline{\text{HOLD}}$ driving circuitry must be open collector or equivalent. Figure 2-5 shows a $\overline{\text{HOLD}}$ drive circuit which is compatible with DTL and TTL logic levels. Note the inversion.

2-27. DECIMAL POINT INPUTS

2-28. The drive circuitry to the DECIMAL POINT inputs, if used, must be capable of withstanding 80 volts when OFF.

MODEL 4312

4-5 CALIBRATION (Figure 4-1)

1. Remove the snap-on bezel.
2. Connect the ANALOG INPUT to the GROUND terminal.
3. Initiate 115 volt ac power ON.
4. Adjust R10 for a display of 000 with the "+" and "−" display toggling.
5. Remove the connections to the ANALOG INPUT.

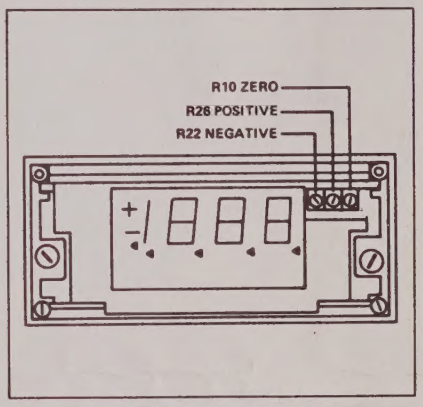

Figure 4-1. Meter Front With Bezel Removed Showing Calibration Potentiometers

6. Using the voltage standard for voltmeters or the current standard for ammeters, provide the ANALOG INPUT necessary for a +1900 display.
7. Adjust R26 for a +1900 display.
8. If the meter is bipolar, repeat step 6, providing a −1900 input. Adjust R22 for a −1900 display.

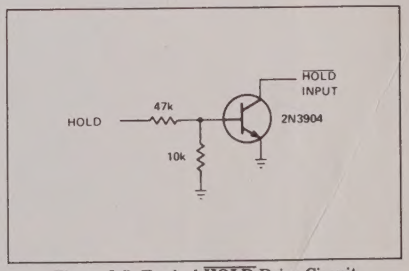

Figure 2-5. Typical $\overline{\text{HOLD}}$ Drive Circuit

CAUTION

If the most significant digit lamp flashes, an overrange condition exists. Excessive overrange levels may cause damage to the meter. Remove the ANALOG INPUT and determine that any overrange level is within specified limits.

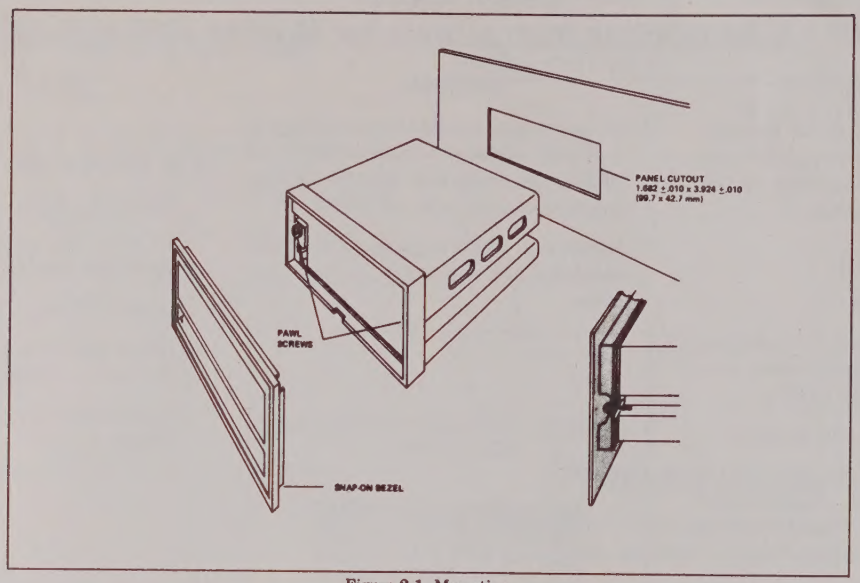

Figure 2-1. Mounting

Mounting (Figure 2-1)

The meter may be mounted in a 1.682 ±.010 by 3.924 ±.010 inch panel cutout. To mount, remove the snap-on meter bezel; rotate the pawl screws several turns counter clockwise to retract pawls; insert meter in panel; tighten pawl screws, and replace bezel. See Figure 2-2 for dimensions. Do not obstruct the vent holes on either side of the meter case.

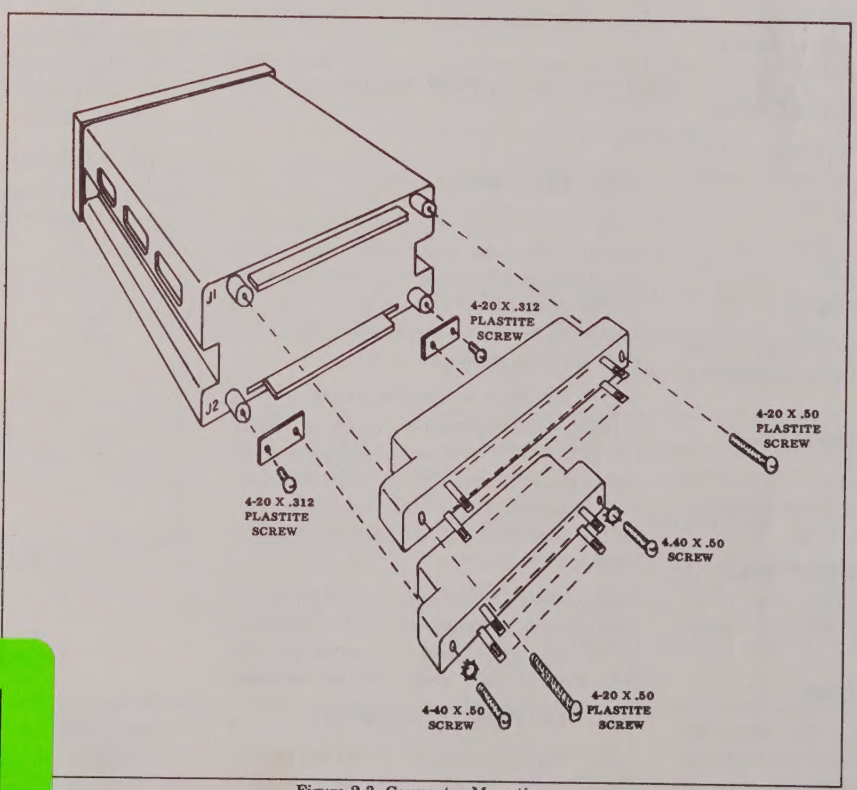

Figure 2-3. Connector Mounting

MP MASTER
MA25740